

What is claimed is:

1. A packet shaper ensuring that packets falling within minimum bandwidth are transmitted to their destinations comprising:

one buffer to store packets;

a buffer output control means to output packets in order in which the packets have been stored into said buffer;

a priority decision means to decide what queuing priority of a packet when storing packets into said buffer; and

a discard control means to judge whether a packet is stored into said buffer or discarded, based on said queuing priority,

wherein:

said priority decision means comprising:

a flow detection unit to detect a flow consisting of a series of packets and determine what flow identifier of said flow by referring to the information contained in the packet header;

a bandwidth check table to hold one entry or a plurality of entries comprising bandwidth check control information which is control information for supervising packet arrival within bandwidth;

a bandwidth check table control means to read an entry at address associated with said flow identifier from said bandwidth check table; and

a check result decision means to determine queuing priority, based on the bandwidth check control information in the entry read by said bandwidth check table control means, the value of a timer indicating current time, and packet length in the packet header,

wherein:

said flow detection unit determines importance of packets of said flow in addition to said flow identifier and said check result decision means determines queuing priority, based on said importance besides said bandwidth check control information, said value of a timer indicating current time, and said packet length in the packet header.

2. A packet shaper according to claim 1, further comprising:

a threshold storage means for high priority packets to store an upper limit (threshold) of said buffer for storing high priority packets, the upper limit to which said discard control means refers when judging whether to store a packet given "high priority" of the queuing priority or discard it;

a threshold storage means for low priority packets to store an upper limit (threshold) of said buffer for storing low priority packets, the upper limit to which said discard control means refers when judging whether to store a packet given "low priority" of the queuing priority or discard it; and

a counter that counts the number of packets stored in said buffer.

3. A packet shaper ensuring that packets falling within minimum bandwidth are transmitted to their destinations comprising:

one buffer to store packets;

a buffer output control means to output packets in order in which the packets have been stored into said buffer;

a priority decision means to decide what queuing priority of a packet when storing packets into said buffer; and

a discard control means to judge whether a packet is stored into said buffer or discarded, based on said queuing priority,

wherein:

said priority decision means comprising:

a flow detection unit to detect a flow consisting of a series of packets and determine what flow identifier of said flow by referring to the information contained in the packet header;

a bandwidth check table to hold one entry or a plurality of entries comprising information items of bucket depth, bandwidth, last packet arrival time, and bucket water level at the last packet arrival which are control information for supervising packet arrival within bandwidth;

a bandwidth check table control means to read an entry at address associated with said flow identifier from said bandwidth check table;

a bucket water level decision means to calculate a bucket water level immediately before the bandwidth check from the read information items of bandwidth, last packet arrival time, and bucket water level at the last packet arrival, and the value of a timer indicating current time; and

a check result decision means to determine queuing priority, based on said bucket water level immediately before the bandwidth check, packet length in the packet header, and bucket depth information,

wherein:

said flow detection unit determines importance of packets of said flow in addition to said flow identifier, said bandwidth check table holds a plurality of bucket depths as said bucket depth information, and said check result decision means determines queuing priority, based on said importance besides said bucket water level immediately before the bandwidth check, said packet length in the packet header, and said bucket depth information.

4. A packet shaper according to claim 3, further comprising:

a threshold storage means for high priority packets to store an upper limit (threshold) of said buffer for storing

high priority packets, the upper limit to which said discard control means refers when judging whether to store a packet given "high priority" of the queuing priority or discard it;

a threshold storage means for low priority packets to store an upper limit (threshold) of said buffer for storing low priority packets, the upper limit to which said discard control means refers when judging whether to store a packet given "low priority" of the queuing priority or discard it; and

a counter that counts the number of packets stored in said buffer.

5. A packet shaper comprising:

a packet storage FIFO buffer to store packets;

a priority decision means to decide what queuing priority of said packets; and

a discard control unit to judge whether a packet is stored into said packet storage FIFO buffer or discarded, based on said queuing priority,

wherein said discard control unit holds a threshold setting for low priority packets to be referred to when judging whether to store a low priority packet into said packet storage FIFO buffer or discard it,

wherein said priority decision means judges whether packets for a plurality of users fall within user-specific

bandwidth within which packet transmission is ensured and those packets that fall within the user-specific bandwidth to be high priority packets,

wherein, if received packets for a user go outside said minimum bandwidth, said priority decision means gives priority to important packets predetermined by said user and determines that these packets are high priority packets.

6. A packet shaper according to claim 5, wherein said discard control means holds a threshold setting for high priority packets to be referred to when judging whether to store a high priority packet into said packet storage FIFO buffer or discard it.

7. A packet shaper according to claim 5, further comprising a counter that counts the number of packets stored in said packet storage FIFO buffer.

8. A packet shaper according to claim 5, wherein said packets for a plurality of users are stored into said same packet storage FIFO buffer.

9. A packet shaper ensuring that packets falling within minimum bandwidth are transmitted to their destinations comprising:

one packet storage FIFO buffer to store packets; a buffer output control means to output packets in order in which the packets have been stored into said packet storage FIFO buffer;

a priority decision means to decide what queuing priority of a packet when storing packets into said packet storage FIFO buffer; and

a discard control unit to judge whether a packet is stored into said packet FIFO buffer or discarded, based on said queuing priority,

wherein said priority decision means comprising:

a flow detection unit to detect a flow consisting of a series of packets and determine what flow identifier of said flow by referring to the information contained in the packet header;

a bandwidth check table to hold one entry or a plurality of entries comprising bandwidth check control information which is control information for supervising packet arrival within bandwidth;

a bandwidth check table control means to read an entry at address associated with said flow identifier from said bandwidth check table; and

a check result decision means to determine queuing priority, based on the bandwidth check control information in the entry read by said bandwidth check table control

means, the value of a timer indicating current time, and packet length in the packet header,

wherein said flow detection unit determines importance of packets of said flow in addition to said flow identifier and said check result decision means determines queuing priority, based on said importance besides said bandwidth check control information, said value of a timer indicating current time, and said packet length in the packet header.

10. A packet shaper according to claim 9, wherein said discard control unit comprising:

a threshold storage means for high priority packets to store an upper limit (threshold) of said packet storage FIFO buffer for storing high priority packets, the upper limit to which said discard control means refers when judging whether to store a packet given "high priority" of the queuing priority or discard it;

a threshold storage means for low priority packets to store an upper limit (threshold) of said buffer for storing low priority packets, the upper limit to which said discard control means refers when judging whether to store a packet given "low priority" of the queuing priority or discard it;
and

a counter that counts the number of packets stored in said packet storage FIFO buffer.

11. A packet shaper ensuring that packets falling within minimum bandwidth are transmitted to their destinations comprising:

one packet storage FIFO buffer to store packets;

a buffer output control means to output packets in order in which the packets have been stored into said packet storage FIFO buffer;

a priority decision means to decide what queuing priority of a packet when storing packets into said packet storage FIFO buffer; and

a discard control unit to judge whether a packet is stored into said packet FIFO buffer or discarded, based on said queuing priority,

wherein said priority decision means comprising:

a flow detection unit to detect a flow consisting of a series of packets and determine what flow identifier of said flow by referring to the information contained in the packet header;

a bandwidth check table to hold one entry or a plurality of entries comprising information items of bucket depth, bandwidth, last packet arrival time, and bucket water level at the last packet arrival which are control information for supervising packet arrival within bandwidth;

a bandwidth check table control means to read an entry at address associated with said flow identifier from said bandwidth check table;

a bucket water level decision means to calculate a bucket water level immediately before the bandwidth check from the read information items of bandwidth, last packet arrival time, and bucket water level at the last packet arrival, and the value of a timer indicating current time; and

a check result decision means to determine queuing priority, based on said bucket water level immediately before the bandwidth check, packet length in the packet header, and bucket depth information,

wherein said flow detection unit determines importance of packets of said flow in addition to said flow identifier, said bandwidth check table holds a plurality of bucket depths as said bucket depth information, and said check result decision means determines queuing priority, based on said importance besides said bucket water level immediately before the bandwidth check, said packet length in the packet header, and said bucket depth information.

12. A packet shaper according to claim 11, wherein said discard control unit comprising:

a threshold storage means for high priority packets to store an upper limit (threshold) of said packet storage FIFO

buffer for storing high priority packets, the upper limit to which said discard control means refers when judging whether to store a packet given "high priority" of the queuing priority or discard it;

a threshold storage means for low priority packets to store an upper limit (threshold) of said buffer for storing low priority packets, the upper limit to which said discard control means refers when judging whether to store a packet given "low priority" of the queuing priority or discard it; and

a counter that counts the number of packets stored in said packet storage FIFO buffer.